

[Technical Calculations]

Selection of Timing Belts 2

[Step 5] Determining Belt Width

(1) Calculate an approx. belt width using the following formula, and then select a belt width(Bw':mm) that is the nearest value to the approximated value.

$$Bw' = \frac{Pd}{Ps \cdot Km} \times Wp$$

Pd: Design Power

Ps: Reference Transmission Capacity Use the Reference Transmission Capacity Table on P.2827~2835.

Km: Engagement Correction Coefficient (Table 13)

Wp: Reference Belt Width (Table 14)

Table 13. Engagement Correction Coefficient(Km)

No. of Teeth Engaged Zm	More than 6	5	4	3	2
Km	1.0	0.8	0.6	0.4	0.2

$$\text{No. of Teeth Engaged}(Zm) = \frac{Zd \cdot \theta}{360^\circ}$$

$$\theta = 180^\circ - \frac{57.3(Dp - dp)}{C}$$

Zd: No. of Teeth of Small Pulley

Dp: Pitch Diameter of Large Pulley(mm)

C: Inter-shaft Distance(mm)

θ : Contact Angle(°)

dp: Pitch Diameter of Small Pulley(mm)

(2) Check if Design Power(Pd) satisfies the following formula. (If not, select the belt width of one size larger again.)

$Pd < Ps \cdot Km \cdot Kb$

Pd: Design Power

Ps: Reference Transmission Capacity

Km: Engagement Correction Coefficient

Kb: Width Correction Coefficient (Table 15)

Table 15. Width Correction Coefficient(Kb)

Type of Belt	Belt Width		Width Correction Coefficient Kb
	Nominal	mm	
MXL	019	4.8	0.72
	025	6.4	1.00
	037	9.5	1.57
	050	12.7	2.18
XL	025	6.4	0.15
	031	7.9	0.21
	037	9.5	0.28
	050	12.7	0.42
L	050	12.7	0.42
	075	19.1	0.71
	100	25.4	1.00
	150	38.1	1.56
H	075	19.1	0.71
	100	25.4	1.00
	150	38.1	1.56
	200	50.8	2.14

Type of Belt	Belt Width		Width Correction Coefficient Kb
	Nominal	mm	
S2M	040	4	1.00
	060	6	1.59
	100	10	2.84
	060	6	1.00
S3M	100	10	1.79
	150	15	2.84
	100	10	1.00
	150	15	1.59
S5M	250	25	2.84
	150	15	0.21
	250	25	1.59
	150	15	0.42
S8M	400	40	0.63
	250	25	0.37
	300	30	0.45
	400	40	0.29
S14M	600	60	0.45
	400	40	0.29
	600	60	0.45
	400	40	0.29

Type of Belt	Belt Width		Width Correction Coefficient Kb
	Nominal	mm	
P2M	40	4	1.00
	60	6	1.59
	100	10	1.78
	150	15	2.84
P3M	100	10	1.00
	150	15	1.59
	150	15	1.00
	250	25	1.79
P8M	100	10	1.00
	150	15	1.60
	200	20	2.30
	250	25	2.90
T5	150	15	1.60
	200	20	2.30
	250	25	2.90
	300	30	3.50
T10	400	40	4.60
	500	50	5.80

Reference Belt Width Tolerance

(Unit:mm)

Belt Width	Belt Length			
	351 or Less	351 to 840	840 to 1680	1680 or More
10 or Less	+0.3 -0.6	+0.3 -0.6	+0.3 -0.6	+0.6 -0.6
10 to 40	+0.6 -0.6	+0.6 -0.6	+0.6 -0.6	+0.6 -0.6
40 to 50	+0.6 -0.6	+0.6 -0.6	+1.0 -1.0	+1.0 -1.3

[Step 6] Check if Inter-Shaft Distance Adjustment Range is Larger than that in Table 16

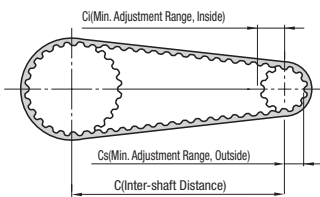


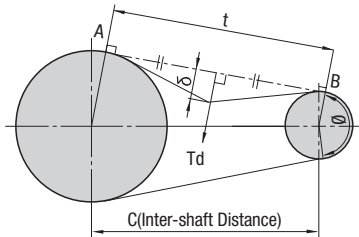
Table 16. Minimum Inter-Axial Distance Adjustment Range

Belt Length	Length Tolerance	Inter-Shaft Distance Tolerance	MXL		XL		L		H		S2M S3M S5M		S8M S14M		MTS8M		P2M P3M P5M		P8M		T5		T10	
			Ci	Cs	Ci	Cs	Ci	Cs	Ci	Cs	Ci	Cs	Ci	Cs	Ci	Cs	Ci	Cs	Ci	Cs	Ci	Cs	Ci	Cs
Less than 150	±0.35	±0.18	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	
150 to 250	±0.41	±0.21		3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	
250 to 380	±0.46	±0.23		5	5	5	5	5	5	2	3	3	3	3	3	3	3	3	3	5	5	5	5	
380 to 500	±0.51	±0.26		10	10	10	10	10	10	2	3	3	3	3	3	3	3	3	3	10	10	10	10	
500 to 750	±0.60	±0.30		10	10	10	10	10	10	3	5	5	5	5	3	5	5	5	5	10	10	10	10	
750 to 1000	±0.66	±0.33		15	15	10	15	15	15	10	3	15	5	15	5	10	5	15	5	5	15	15	15	
1000 to 1250	±0.76	±0.38		15	15	15	15	15	15	5	10	5	10	5	10	5	10	10	15	15	15	15	15	
1250 to 1500	±0.82	±0.41		25	25	25	25	25	25	5	10	10	10	10	10	10	10	10	25	25	25	25	25	
1500 to 1750	±0.86	±0.43		25	25	25	25	25	25	5	10	10	10	10	10	10	10	10	25	25	25	25	25	
1750 to 2000	±0.92	±0.46	30	30	30	30	30	30	5	10	10	10	10	10	10	10	10	30	30	30	30	30		

Cautions on Use of Belt

How to Extend Belt

When the belt is too taut, its service life can be shortened, while when it is not taut enough, the belt may(jump off)the groove of the pulley due to an activating torque or shock load. Keep the belt stationary and optimize its tautness. The warp load necessary to provide the optimum tautness can be calculated from values representing the belt, its width and the span in equation A below.



$$Td = \frac{Ti + \frac{t \times Y}{Lp}}{16}$$

Equation A

Td: Load N Needed for Deflection d at the Center of Span t

Ti: Initial Tension N From Table 17

Lp: Length of the Belt(mm)

Y: Correction Coefficient From Table 17

C: Inter-shaft Distance(mm)

δ: Deflection(mm) δ=0.016t

$$t = \sqrt{C^2 - \frac{(Dp - dp)^2}{4}}$$

dp: Diameter of the Pitch Circle of the Small Pulley(mm)

Dp: Diameter of the Pitch Circle of the Large Pulley(mm)

Table 17. Initial Tension(Ti)and Correction Coefficient(Y)

Type	Ti-Y	Belt Nominal Width		019	025	031	037	050	075	100	150	200
		Belt Width (mm)	mm	4.8	6.4	7.9	9.5	12.7	19.1	25.4	38.1	50.8
MXL	Ti	Max. Value	9.8	13.7	-	21.6	29.9	-	-	-	-	-
	N	Recommended Value	5.8	8.2	-	12.9	18.0	-	-	-	-	-
	Coefficient Y		-	-	-	-	-	-	-	-	-	-
	Max. Value		-	29	37	44	67	-	-	-	-	-
XL	Ti	Recommended Value	-	18	25	32	51	-	-	-	-	-
	Coefficient Y		-	3.8	5.4	7.6	11.8	-	-	-	-	-
	Max. Value		-	-	-	-	76	125	175	273	-	-
	N	Recommended Value	-	-	-	-	52	87	123	191	-	-
L	Ti	Recommended Value	-	-	-	-	-	44.1	75.5	107	165	-
	Coefficient Y		-	-	-	-	-	-	-	-	-	-
	Max. Value		-	-	-	-	-	293	421	646	889	-
	N	Recommended Value	-	-	-	-	-	222	312	486	668	-
H	Ti	Recommended Value	-	-	-	-	-	-	142	205	317	423
	Coefficient Y		-	-	-	-	-	-	-	-	-	-

Type	Ti-Y	Belt Nominal Width		60	100	150	250
		Belt Width (mm)	mm	6	10	15	25
P2M	Ti	Max. Value	13	-	-	-	-
	N	Recommended Value	9.8	-	-	-	-
	Coefficient Y		0.9	-	-	-	-
	Max. Value		-	46	74	-	-
P3M	Ti	Recommended Value	-	34	55	-	-
	Coefficient Y		-	1.9	3.0	-	-
	Max. Value		-	-	-	-	-
	N	Recommended Value	-	-	-	-	-
P5M	Ti	Recommended Value	-	147	225.4	-	-
	Coefficient Y		-	56.9	82.4	-	-
	Max. Value		-	-	-	-	-
	N	Recommended Value	-	-	-	-	-
P8M	Ti	Recommended Value	-	-	294	509.6	-
	Coefficient Y		-	-	225.4	382.2	-
	Max. Value		-	-	-	-	-
	N	Recommended Value	-	-	-	-	-

Type	Ti-Y	Belt Nominal Width		40	60	100	150	250	300	400	600
		Belt Width (mm)	mm	4	6	10	15	25	30	40	60
S2M	Ti	Max. Value	7.8	12.7	22.6	-	-	-	-	-	-
	N	Recommended Value	5.9	9.8	16.7	-	-	-	-	-	-
	Coefficient Y		9.8	15.7	27.4	-	-	-	-	-	-
	Max. Value		-	26	46	73	-	-	-	-	-
S3M	Ti	Recommended Value	-	20	34	54	-	-	-	-	-
	Coefficient Y		-	26.5	46.1	75.5	-	-	-	-	-
	Max. Value		-	-	77	124	221	-	-	-	-
	N	Recommended Value	-	-	58	93	166	-	-	-	-
S5M	Ti	Recommended Value	-	-	-	52.8	85.5	151.0	-	-	-
	Coefficient Y		-	-	-	-	-	-	-	-	-
	Max. Value		-	-	-	294	510	628	873	-	-
	N	Recommended Value	-	-	-	226	382	470	657	-	-
S8M MTS8M	Ti	Recommended Value	-	-	-	-	98	196	235	333	-
	Coefficient Y		-	-	-	-	-	-	-	-	-
	Max. Value		-	-	-	-	-	1226	1912	-	-
	N	Recommended Value	-	-	-	-	-	1108	1726	-	-
S14M	Ti	Recommended Value	-	-	-	-	-	-	686	1059	-
	Coefficient Y		-	-	-	-	-	-	-	-	-

Belt Nominal Width			100	150	200	250	300	400	500
Type	Ti-Y	Belt Width (mm)	10	15	20	25	30	40	50
T5	Ti N	Max. Value Recommended Value	37.3 24.5	59 39	85 59	106 74	—	—	—
	Coefficient Y		16.7	26.5	38.2	47.5	—	—	—
T10	Ti N	Max. Value Recommended Value	—	162 108	235 157	294 196	363 245	500 333	628 422
	Coefficient Y		—	71.6	104.9	130.4	163.8	222.6	281.5